Crookes tube, which was excited for some minutes. On development, shadows of all the articles placed on the slide were clearly visible, some being more opaque than others. Further experiments were tried with thin plates of aluminium or of black vulcanised fibre interposed between the objects to be photographed and the sensitive surface, this thin plate being used in place of the wood of the camera back. In this manner sharper shadow pictures were obtained. While most thick metal sheets appear to be entirely opaque to the radiations, aluminium appears to be relatively transparent. Ebonite, vulcanised fibre, carbon, wood, cardboard, leather and slate are all very transparent, while, on the other hand, glass is exceedingly opaque. Thin metal foils are moderately opaque, but not altogether so.

As tending to the view that the radiations are more akin to ultra-violet than to infra-red light, it may be mentioned that a solution of alum in water is distinctly more transparent to them than a solution of iodine in bisulphide of carbon.

So far as our own experiments go, it appears that, at any rate without very long exposures, a sufficiently active excitation of the Crookes tube is not obtained by direct connection to an ordinary Rhumkorff induction coil, even of a large size. So-called high frequency currents, however, appear to give good results, and our own experiments have been made with the tube excited by current obtained from the secondary circuit of a Tesla oil coil, through the primary of which were continuously discharged twelve half-gallon Leyden jars, charged by an alternating current of about 20,000 volts pressure, produced by a transformer with a spark-gap across its high-pressure terminals.

For obtaining shadow photographs of inanimate objects, and for testing the relative transparency of different substances, the particular form of Crookes tube employed does not appear to greatly signify, though some forms are, we find, better than others. When, however, the human hand is to be photographed, and it is important to obtain sharp shadows of the bones, the particular form of tube used and its position relative to the hand and sensitive plate appear to be of great importance. So far, owing to the frequent destruction of the tubes, due to overheating of the terminals, we have not been able to ascertain exactly the best form and arrangement for this purpose, except that it appears desirable that the electrodes in the tube should consist of flat and not curved plates, and that these plates should be of small dimensions.

The accompanying photograph of a living human hand (Fig. 1) was exposed for twenty minutes through an aluminium sheet ·0075 in thickness, the Crookes tube, which was one of the kind containing some white phosphorescent material (probably sulphide of barium), being held vertically upside down, with its lowest point about two inches above the centre of the hand.

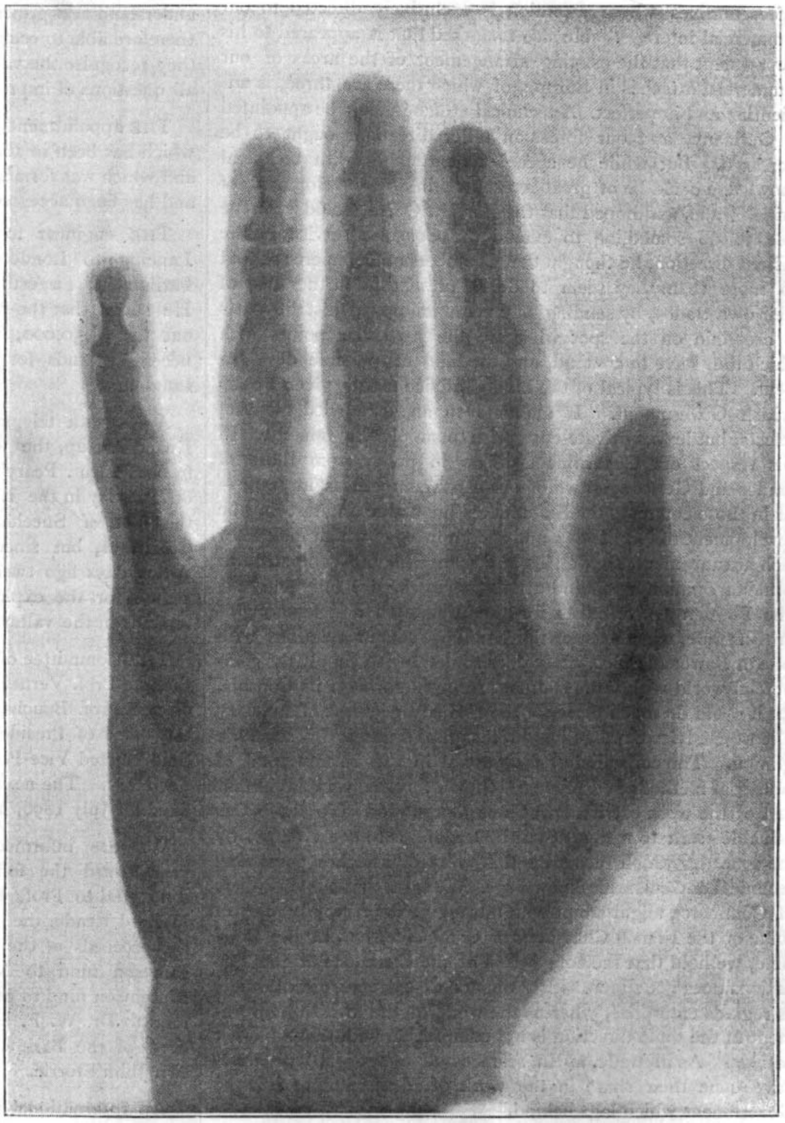

FIG. 1.—Photograph of a living human hand.

By substituting a thin sheet of black vulcanised fibre for the aluminium plate, we have since been able to reduce the exposure required to four minutes. Indeed with the aluminium plate, the twenty minutes' exposure appears to have been longer than was necessary. Further, having regard to the great opacity of glass, it seems probable that where ordinary Crookes tubes are employed, a large proportion of the active radiations must be absorbed by the glass of the tube itself. If this is so, by the employment of a tube partly constructed of aluminium, as used by Lenard, the necessary length of exposure could be much reduced.

A. A. C. SWINTON.

NOTES.

AT their scientific meeting on March 3, the Zoological Society propose to discuss the much-vexed question of zoological nomenclature. This subject will be introduced by Mr. Sclater, the Secretary of the Society, who will read a paper on the "Rules for naming Animals," lately adopted by the German

Zoological Society, and point out the divergences between them and what is called the Stricklandian Code of Nomenclature, recognised by the British Association, and usually followed in this country.

THE question of technical and commercial attachés to British Embassies was referred to by the Right Hon. George Curzon, M.P., Under Secretary for Foreign Affairs, in the course of some remarks to the Wolverhampton Chamber of Commerce last week. He acknowledged that it is desirable, in many of those countries where our commercial connection is large, to have representatives whose attention is exclusively directed to our commercial interests. He also remarked that it appeared to his Department that the existing arrangement of the areas of our commercial attachés in Europe, of which there are three, is unscientific and imperfect. A technical attaché should be appointed in Germany, and our forces in other directions ought to be increased. But while he agreed that attachés with technical knowledge could be of great assistance in the development of British trade, and hoped that the Foreign Office would soon be able to do something to extend the Consular service in the desired direction, he thought that Chambers of Commerce should do more than they seem to do at present in furtherance of their own trades, by sending out commissions to distant parts to ascertain on the spot what are the particular points with which they have to contend, and the lines of possible development. This is typical of the kind of advice usually given by the British Government. It amounts to an acknowledgment of defects, but leaves private enterprise to supply the remedy. In this respect our Government differs in policy from those of France and Germany—two of our chief competitors in trade—for in those countries the State takes an active interest in the development of industries; and the knowledge which makes for such advancement, as well as the men who are competent to form an opinion upon industrial processes, are fully utilised. The Foreign Office exists for the promotion and fostering of British trade, as well as for the handling of our relations with foreign Powers. It certainly does something to supply the commercial world with trade statistics received through its Consuls, but it could do much more for the real advancement of industry if it were advised and guided in technical matters by scientific opinion. The collection of facts useful in the improvement of industrial methods and processes should form a very important part of the work carried on at our Consulates. To leave this valuable work to men sent out by traders, is to court defeat by the countries which recognise the value of attachés possessing technical and scientific knowledge. We agree that our Chambers of Commerce might adopt with advantage the forward policy of some of the French Chambers of Commerce, but, at the same time, we hold that the comparison of the Chambers of the two nations does not show British traders to extreme disadvantage as regards enterprise, whereas the work of the British Government in the same direction is not comparable with that of other nations. As in trade, so in science and education, individuals have done their share in the work of advancement; it is the Government which lags behind.

As an example of what private associations do to discover in what way industrial practices and processes on the continent differ from those in Great Britain, we may mention the delegation recently organised by the British Iron Trade Association for the purpose of inquiring into the conditions of competition in the iron and steel industries of the continent. The report of the delegates has just been finally adopted by the Association, and one or two points in it furnish instructive reading. It is admitted that both Belgium and Germany are well to the front in regard to mechanical appliances. The general arrangement of the blast furnace plants was modern and excellent, and they appeared to be worked to secure a large output with a minimum of capital and labour expenditure. In the finished iron and steel works visited, the practice adopted was excellent, and in some respects in advance of England. But of more especial interest to us is the fact that attention is called to the greater importance attached in Germany than in England to technical education, and the facilities given for its acquisition. This is regarded as one of the reasons why Germany has been able to quickly acquire, and make rapid advances in, iron and steel manufacture. On account of the attention given to scientific and technical education, the masters, as a rule, thoroughly understand the principles of their industrial processes, and are therefore able to economise in matters of detail; and moreover, they recognise the value of scientific advice and guidance upon all questions of improved methods.

THE appointment of Scientific Adviser to the Trinity House, which has been in abeyance since the resignation of Dr. Tyndall, and which was formerly held by Prof. Faraday, has been revived, and has been accepted by Lord Rayleigh.

THE engineer to the scheme for bringing sea-water from Lancing to London has prepared, for the information of Parliament, an estimate of the entire cost of this scheme. He states that the works contained in the Bill can be carried out for £450,000, which includes the acquisition of all the necessary lands for the distribution of sea-water throughout London.

A REUTER telegram from Christiania announces that Lieut. Ewind Astrup, the well-known Polar explorer, who took part in both Lieut. Peary's Greenland expeditions, was found dead on Tuesday in the Lille-Elvedal. Lieut. Astrup left Jerkin, at the foot of Sneehätta, in the Hovre Fjeld, shortly before Christmas, but since then nothing had been heard of him. A few days ago twenty-five men on snow-shoes started out to search for the explorer, with the result that they found his remains in the valley.

THE Committee of the Œuvre de la Tuberculose, founded by the late Prof. Verneuil, have (says the *British Medical Journal*) elected Prof. Bouchard to succeed that distinguished surgeon in the office of President. Prof. Lannelongue was at the same time elected Vice-President, and Dr. L. Henri Petit, General Secretary. The next Congress on Tuberculosis, which had been fixed for July 1896, has been postponed to 1897.

WE are informed that the Geological Society will this year award the following medals and funds:—The Wollaston medal to Prof. E. Suess, the Murchison medal to Mr. T. Mellard Reade, the Lyell medal to Mr. A. Smith Woodward, the proceeds of the Wollaston fund and part of the Barlow-Jameson fund to Mr. Alfred Harker, the proceeds of the Murchison fund to Mr. Philip Lake, the proceeds of the Lyell fund to Dr. W. F. Hume and Mr. W. C. Andrews, the proceeds of the Barlow-Jameson fund to Mr. Joseph Wright and Mr. John Storrie.

AN International Exhibition is to be held at Brussels in 1897. The exhibition will comprise fourteen sections: 1. Fine arts. 2. Social economy. 3. Hygiene. 4. Life saving. 5. Industrial and decorative arts. 6. Lighting and heating. 7. Electricity—traction. 8. Military art. 9. Industrial manufactures—materials, methods, and products. 10. Sporting material. 11. Exercises—popular games. 12. Temporary competitions in agriculture and horticulture. 13. Practical teaching, and the industries and handiwork of women. 14. Trade. Colonies.

A PRELIMINARY account of the Florentine earthquake of last May 18, the strongest felt in the district during the present century, has been written by Dr. M. Baratta. The chief damage to buildings occurred within a nearly circular area about 35 km. in diameter, the centre of which is close to Florence. The disturbed area contains about 27,000 sq. km. Under the form of microseismic movements, the earthquake was recorded at several Italian observatories, and also at Grenoble (France), which is 460 km. from Florence, the mean velocity to the latter place being 1·75 km. per second.

According to a Reuter telegram from Christiania, the estate of Hafslund, near the great waterfall known as the Sarpsfos, between there and Göteborg, has been acquired by a syndicate, consisting chiefly of German and American capitalists, for the sum of 800,000 kroner. The purchasers intend to form a large company with a capital of three to five million kroner, in order to utilise the water power of the falls for electrical power, and establishing aluminium works on the same principle as planned at the Falls of Foyers in Scotland. The Sarpsfos is one of the finest falls in south-eastern Norway, being 74 feet in height and 116 feet in width.

The ancestral history of the horse, long familiar as a most striking instance of the possibility of tracing a pedigree by the aid of palæontology, is now being worked out still more minutely. In a paper just published (*Bull. Amer. Mus. Nat. Hist.*, December 23, 1895) on the Perissodactyls of the White River beds (Oligocene and Lower Miocene), Messrs. Osborn and Wortman announce the discovery of so complete a series of intermediate forms between *Mesohippus Bairdi* and *Anchitherium præstans*, that a strict definition of generic and specific names becomes impossible. These two and the intermediate types "form a closely-connected phylogenetic series of animals, slowly specialising and constantly increasing in size. So far as we know," the authors add, "there is not a single character missing in the structural chain."

Among the many points of interest which they possess, the Ratite birds of the southern hemisphere have presented no feature more curious and more inexplicable than the opercular fold which covers the transitory gill-slits in the neck of the embryo. The fold was first discovered five years ago by Prof. T. J. Parker, who described its occurrence in embryos of the New Zealand *Apteryx;* but its recent discovery by Prof. Nassonow in embryos of the ostrich also (*Zool. Anzeiger*, No. 492) shows that it is a feature which probably characterises the development of all the Ratite birds. A branchial operculum has not, however, been observed in the early stages either of reptiles or of Carinate birds, and the retention of so obviously amphibian a character in Ratite birds alone among Sauropsida provides a puzzle for ornithologists and embryologists alike.

It is interesting to note, with reference to the observation of of the meteor seen at Cahirciveen on the 6th inst. (Nature, p. 253), notice of which was sent to us by Mr. R. H. Scott, that according to a letter received at the Meteorological Office from Dr. A. Riggenbach, of Basle, a similar phenomenon was seen at Hochwald, about seven miles to the south of the former place, at 6 p.m. on the same evening. The observer noticed over the mountains of Nunningen what appeared to be a star of unusual magnitude. After looking at it for some time he was surprised to find it moving and leaving a long trail after it. The light increased in splendour, being first of a yellowish colour, which, upon the bursting of the meteor into three or four pieces, assumed a bluish-green colour. The movement continued in a south-westerly direction for about 1½ seconds, when the phenomenon disappeared below the horizon.

The history of the introduction of the first hermetically-sealed thermometer into France is contained in *Cosmos* of the 4th inst., with extracts from the correspondence of Pierre des Noyers, Secretary of the Queen of Poland. In 1657 he sent a description of a Florentine thermometer to M. Boulliau, of Paris, with a drawing of it, which is reproduced in *Cosmos*, and in 1658 a specimen of the instrument was sent to Paris, and was apparently used by M. Boulliau on June 25 of that year. This thermometer was graduated by means of small black enamelled knobs on the outside of the tube, and was subsequently improved by the Accademia del Cimento. A full description of the instrument is contained in Prof. Hellmann's "Anfänge der meteorologischen Beobachtungen und Instrumente" in *Himmel und Erde*, vol. ii. p. 175 (see Nature, vol. xlii. p. 207). We are indebted to M. G. Maze for the publication of extracts from the interesting original documents which are contained in the National Library in Paris.

An account of some ingenious experiments on wind pressure is reported in *Engineering* of December 27 last, made by Messrs. H. C. Vogt and I. Irminger, of Copenhagen, to prove that "the greater part of the lifting power of an aeroplane, or the thrust of a close-hauled sail, was to be attributed to the rarefaction on the leeward side of the same, and not to the direct pressure." The experiments seem to show that even when a pressure-plate was perpendicular to the wind, the direct pressure was equal to only about one-third of the vacuum behind, and that when the vane was placed parallel to the wind, a negative pressure was indicated. For the purpose of the experiments, a current of air was produced by inserting in the side of a high chimney connected with the Gas Works one end of a rectangular conduit, the interior sectional area of which was 4½ × 9 inches, and the length 40 inches. In this conduit was placed a hollow vane which reached from side to side, but the width of which was only 1⅝ inches. The interior of the hollow vane was connected through its axis with a water-gauge, and the arrangement was such that the vane could be turned to any desired angle. Three holes were bored in both faces of the vane, but only one of these holes was used at a time, the others being stopped when not in use. We think that the results arrived at should be accepted with caution. The second leg of the pressure-gauge was connected with the inside of the conduit by an opening just above the vane, and there seems to be little doubt that the disturbance of the air current must, in such a small passage, have been considerable, and would probably affect the pressure upon the hole connected with the second leg of the gauge. This may possibly account for some of the rather improbable results obtained.

The Scalpel—a monthly journal of medicine and surgery—has just made its bow to a medical public. The new journal is edited by Dr. T. M. Dolan, and it will be conducted upon much the same lines as the late *Provincial Medical Journal.*

The January *Journal* of the Sanitary Institute (vol xvi. part iv.) contains a paper on infectious diseases and methods of disinfection, by Dr. E. Seaton; and among the articles is one on the Hermite process for sanitation of towns, by Mr. E. J. Paterson.

The careers of few men inspire such international admiration as the life of Huxley. His sterling qualities stand out so boldly that they command the attention of the entire intellectual world. The latest biographical notice that we have seen has appeared in the last two numbers of the *Revue Scientifique*, the author being Dr. H. de Varigny. We commend Dr. Varigny's appreciative notice to the attention of those who would be interested to learn of the high regard in which Huxley's works are held among men of science in France.

We have received from Prof. G. Klebs, of Basel, an interesting paper entitled *Ueber einige Probleme der Physiologie der Fortpflanzung.* He deals with all the most recent observations on the phenomena of non-sexual propagation and of sexual reproduction, especially in the vegetable kingdom, and sums up in favour of the view that the non-sexual was the original universal mode of multiplication. He supports this view largely by the phenomena of parthenogenesis, and by the fact that it is possible, by preventing the conjugation of the two gametes in *Spirogyra*, to cause each of them to develop into a "spore" fully capable of germination.

THE additions to the Zoological Society's Gardens during the past week include a Mozambique Monkey (*Cercopithecus pygerythrus*, ♂) from East Africa, presented by Miss Louisa Hutt; a Pig-tailed Monkey (*Macacus nemestrinus*, ♂) from Java, presented by Mr. W. Englehardt; a Puff Adder (*Vipera arietans*) from South Africa, presented by Mr. J. E. Matcham; two Golden-crowned Conures (*Conurus aureus*) from South-east Brazil, deposited; two Black-headed Caiques (*Caica melanocephala*) from Guiana, a Green-cheeked Amazon (*Chrysotis viridigenalis*), from Columbia, purchased.

OUR ASTRONOMICAL COLUMN.

A NEW AUSTRALIAN OBSERVATORY.—The site for the new observatory, which the Government of West Australia are about to erect, has been selected at Perth. The cost of the buildings and instruments is estimated at about £5000. The latter will have such improvements on ordinary construction as have been suggested by experience with the instruments used at the Adelaide Observatory. The equipment will include an equatorial having an object-glass of 8 inches aperture. This instrument will be furnished with a spectroscope, and with photographic appliances. There will also be a transit circle 6 inches in diameter. The post of Astronomer has been filled by the appointment of Mr. W. Ernest Cooke, the Assistant Astronomer of South Australia. Mr. Cooke is an Australian by birth, and has been trained under Sir Charles Todd in observatory work.

THE SUN'S PATH IN SPACE.—The question as to a possible orbital movement of the solar system is revived by Mr. G. C. Bompas in the current number of the *Observatory*. Determinations of the position of the apex of the sun's way have been variously based on groupings of selected stars according to number, magnitude, or proper motion, the latter being now acknowledged the best test of distance. When arranged according to the distances of the stars on which they are based, the results seem to indicate that the position deduced from the nearer stars moves south-west along the plane of the Milky Way, as compared with the apex derived from stars supposed to be more distant. If the sun's path were rectilinear and the stars at rest, the "radiant point" would be the same for near and distant stars, but if curvilinear it would be shifted in accordance with the varying direction of the tangent, and the displacement would be in proportion to the apparent velocity. From existing data, Mr. Bompas considers it probable that the sun moves in a retrograde orbit from east to west in a plane inclined a few degrees to the Milky Way, and the conclusion is independent of any further consideration as to the presence or absence of a systematic movement of the stars round a common centre. "The relation of the solar system to the galaxy would thus resemble that of Uranus and his moons to the ecliptic, the solar system being inclined about 70° to the plane of the galaxy and the planets revolving round the sun in a reverse direction to the orbit attributed to the sun."

EQUATORIAL VELOCITY OF JUPITER.—A spectroscopic determination of the equatorial velocity of rotation of Jupiter has been made by Dr. Belopolsky, the resulting value being 11·4 kilometres per second (*Ast. Nach.* 3326). Taking the rotation period to be 9h. 50m., the calculated velocity varies from 12·1 to 12·8 kilometres per second, according to the angular diameter which is accepted. Although the difference between the observed and computed velocity is possibly within the limits of error in measurement, it is not considered improbable that the apparent discrepancy may have its origin in the increase of the angular diameter of the planet due to refraction in its atmosphere, and the consequent apparent increase of the calculated linear velocity. A similar result has been observed in the case of Saturn, the measured velocity being smaller than that which the known rotation period and angular diameter require.

PERRINE'S COMET.—The comet discovered by Mr. Perrine on November 16, 1895, was well observed in the northern hemisphere up to December 7, when it was seen at Greenwich, and stated to be very bright with a conspicuous tail. It was thought that it might possibly be subsequently observed in daylight in the southern hemisphere, but no observations have been published so far as we are aware. Towards the end of January it will be sufficiently removed from the sun to be seen as a morning comet, but with greatly diminished brightness. The following ephemeris, for Berlin midnight, is by Dr. E. Lamp:—

	R.A.			Decl.		Brightness.
	h.	m.	s.	°	′	
Jan. 24	19	37	27	−7	3·4	0·43
28		39	13	5	51·2	0·35
Feb. 1		40	50	4	41·6	0·29
5		42	17	3	33·7	0·25
9		43	34	2	27·0	0·21
13		44	40	1	21·0	0·18
17		45	33	−0	15·5	0·16
21		46	13	+0	49·8	0·15
25		46	38	1	55·1	0·13
29		46	48	+3	0·7	0·12

The unit of brightness is that on November 18.

OYSTERS AND TYPHOID.

THE fourth meeting of the tenth session of the Liverpool Biological Society was held on January 10, at University College, Liverpool. During the evening an interesting report on "Green Oysters, and the connection between Oysters and Disease" was presented by Prof. Herdman, who explained that a year ago he and Prof. Boyce commenced to investigate the conditions under which oysters lived healthily. Among other matters they directed their particular attention to the possibility of the oyster being infected by sewage in sea-water with the typhoid organism, and of so transmitting the disease to the consumer. At the meeting of the British Association at Ipswich, last September, they communicated the results they had obtained up to that point, and then they were appointed (with the addition of Prof. Sherrington and Mr. G. C. Bourne) as a committee to investigate the matter further. At present they were really in the midst of their observations; and the present communication could only be regarded in the nature of an interim report, as their conclusions would not be drawn up for publication until the meeting of the British Association in September next. In the meantime a most alarming and widespread scare, following upon incidents connected with a ball at Stirling, on October 1, had arisen, it being assumed that there was some connection between oysters and an outbreak of typhoid. This had considerably affected the important oyster trade of the country, and had probably thrown a great deal of quite undeserved suspicion upon perfectly wholesome oysters. Under these circumstances they had felt it their duty to take an early opportunity of stating their results and impressions as they stood at present. Their work, so far as it had gone, was of a reassuring character, and demanded from the public at the very least a suspension of judgment, whilst it indicated that the adoption of some simple sanitary precautions would, if properly carried into effect, go far to remove suspicion from the oyster. Prof. Herdman then proceeded to describe, with the aid of lantern slides, specimens and microscopic preparations, the different descriptions of oysters which are supplied in North-west Europe, and the methods of treatment they are subjected to prior to being placed on the market. He dealt with the cultivation of the French green oyster, and discussed the cause of the green colour, both in that oyster and in Americans relaid on the Lancashire coast. He pointed out that the most important precaution to take in oyster culture was to choose perfectly healthy grounds for the fattening process, it being necessary, in the first place, to ascertain that the purity from sewage of the water was beyond question. Further it was advisable to submit the oysters for a short time to disgorging basins or tanks, a method which was adopted with success by the French, before sending them to the market. Prof. Boyce then followed with an account of the experiments on the infection of oysters with typhoid, and showed, by means of tables, the rate at which the typhoid bacillus disappeared in sea-water. There was no evidence of increase in numbers of the bacillus when grown in sea-waters, either when incubated or at ordinary temperatures.